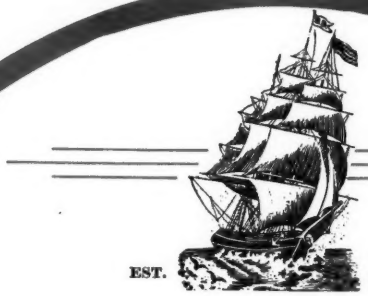
The American Fertilizer

Vol. 92 MAY 11, 1940 No. 10



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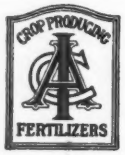
TRADE  MARK

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See Page 25

...THE...

AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

Vol. 92 MAY 11, 1940 No. 10

How Shall We Fertilize Vegetable Crops?*

By VICTOR A. TIEDJENS

Agricultural Experiment Station, New Brunswick, New Jersey

RESULTS from investigations to determine the best method of applying fertilizer for row crops during the past season on 17 vegetable farms indicate in each case that plowing under chemical fertilizers gave as good or better yields than the growers' methods which consisted of either row, side-dressing, broadcasting, or combinations of several methods. These tests were made on light to medium heavy soils which were fair to good for lime and pH.

The biggest yields of tomatoes on fertilizer plots at the New Jersey experimental farm at New Brunswick during the past three growing seasons were obtained where two-thirds to all of the fertilizer was broadcast before the ground was plowed. Where either 500, 1,000, or 1,500 pounds of 5-10-10 fertilizer were placed in 2-inch bands, 1 foot long and 4 inches from the plants on either side, the yields were lower by 4 tons than where the fertilizer was plowed under. Broadcasting all the fertilizer after plowing or half of it and applying the remainder as two side-dressings, or placing the superphosphate under the row and applying the nitrogen and potash as side-dressing fell short of the highest yield by 1 to 3 tons.

These results were obtained on a soil having a pH of 6.2 to 6.4. On acid soil the same plots might have produced differently. The maximum yield was 14.5 tons of tomatoes. The method that would prevent rapid fixation of the phosphoric acid undoubtedly would have produced the largest yields. The band method probably would show up much better. However this is not necessarily the case for all crops.

Sweet potatoes, which also must be grown on acid, sandy soils to prevent ground diseases from making the crop unmarketable, have not produced particularly good yields by the banding methods in comparison with other methods in experimental plots on Fred Bateman's farm at Grenloch, New Jersey. In 1939 sweet potatoes where the fertilizer was all applied as a side-dressing 2 and 5 weeks after the plants were set produced 150 bushels more than where the fertilizer was applied in bands.

All of our vegetable crops except the two potato crops will tolerate lime and will do particularly well at a pH of 6.5 on mineral soils. At those pH values we probably need not concern ourselves with the availability of phosphoric acid.

The Band Method

The fact that the band method has produced the same yields with one-half the fertilizer does not seem to be any particular advantage. If the facts were known, we might just as correctly assume that the grower was using too much fertilizer and in so doing burned the roots of his plants. It seems that we have not studied enough plots to know the truth. The banding method does prevent root injury where seed is sown. Where plants are set, as with sweet potatoes, it seems that even this method of applying fertilizer retards the growth, even though the fertilizer is not in direct contact with the roots.

Our light sandy loams and loamy sands present another problem because of the ease with which soluble salts leach during periods of heavy rainfall. On such soils our concern is not to prevent fixing of phosphoric acid but of supplying fertilizer in sufficiently small quantities to prevent salt injury and at intervals frequent enough to supply the needs of the plants.

* Reprinted from "Better Crops with Plant Food," April, 1940.

The method of applying fertilizer that will produce the best results for our crops will depend on phosphoric acid availability for those crops which must be grown on acid soils, uniform distribution of fertilizer for those crops that will do best on well-limed soils, and frequent application of small quantities for those crops which are grown in sandy soil. Fertilizer injury must be prevented in each case. Furthermore, we must keep in mind the cost of the fertilizer applied to the crop in each case.

Plowing under animal manures was always considered wise practice and good assurance that a worthwhile crop would be grown. The manure was applied to the surface and plowed under with refuse, cover crops, or grass sod. It contained plant food that was released gradually as the crop grew. The area that was covered was determined by the amount available. Very often the field was only partly covered, and the crop that followed showed where the dividing line was. Generally the manure was applied for the cash or vegetable crop in a rotation, a field reveiving manure only once in 3 or 4 years. Yields were not estimated on the basis of the amount of manure applied, but according to the time the crop was planted, the particular season, or on how well the ground had been prepared.

There have been many arguments regarding the method that would make the best use of manure. Who has not seen the result of hauling manure to the field and distributing it in small heaps to be spread by hand several weeks or months later? The outlines of these piles were visible several years later. It was considered poor management. But when we see the effect of row applications of chemical fertilizers several years later in the growth made from the residual fertilizer, we shrug our shoulders and say it is inevitable. I wonder whether it is? The manure spreader put an end to the manure heaps. Perhaps we need a broadcasting machine to put an end to the uneven growth from row applications of chemicals.

There was no question regarding the efficacy of manure for growing crops, and the question of toxicity or burning was never thought of. It could be used as a top-dressing on meadows and pastures by spreading it evenly over the surface, or it was plowed under for cultivated crops. Very often it was plowed under in the late summer or early fall for the crop the following spring. In spite of plowing it all under, good crops could always be expected from manure. But when we use chemical fertilizer we feel that we have to apply this plant food as close to the crop as possible when it is planted. I wonder whether this is necessary.

As far as the vegetable grower is concerned, the use of chemical fertilizer probably began with the use of superphosphate as a supplement to manure, although numerous other materials had been added to soils more or less spontaneously, in the early history of plant nutrition. Substituting chemicals for manure built up a need for research to determine the best method of applying these chemicals, and up to the present time the great bulk of these investigations has been based on the idea of applying the fertilizer on top of the plowed ground rather than deeper in the soil where the roots must function.

The use of chemicals marked the beginning of trouble for the farmer and work for the Agricultural Experiment Stations. Tests and experiments were established to compare the value of chemicals with manure. Only in recent years has the acidity of the soil been taken into consideration in such investigations. Very often the fertility level of the soil has been ignored.

Many investigations were established on soils containing too much fertility, and contradictory results were obtained. The condition of the field was not mentioned when a report of the experiment was made. Where differences were obtained, manure usually gave best results, particularly if it was supplemented with a small amount of superphosphate. Minor elements of course played no part, because of the manure that had been used in the past. Lime was considered as a soil amendment and not a plant food. Manure contained enough calcium and magnesium to go around. Even acid soils produced good crops with manure, because toxic materials were absorbed by the manure.

New Problems Arose

Intensive vegetable production probably was responsible for the complete substitution of chemicals for manure. Manure became scarce. A few hundred pounds of chemicals substituted for manure were gradually increased by leaps and bounds. If a little was good, more was better; and finally manure was considered unnecessary, particularly since it was difficult to get. For a time chemical fertilizers gave startling results. Gradually, as the residual manure and lime were being exhausted, it required more fertilizer to get the necessary kick. And if the story were known, fertilizers were used in greater quantities, not because a complete ferti-

lizer was needed, but because phosphorus or potassium or calcium was getting too low.

To add to the difficulty, the chemicals were used near the plants, and as the amounts increased, the roots became injured. Everything was blamed except the fertilizer. Plant pathologists, entomologists, crops specialists, and even economists were called in to diagnose the farmer's problem. All because he tried to grow plants in an unbalanced brine solution around the roots. If the plants were not injured directly, the large amount of plant food in close proximity to the roots restricted root growth, and dry weather took more than the usual toll. The tops grew abnormally, and the plants did not set fruit or were more susceptible to disease organisms.

From 1,500 to 2,000 pounds of soluble plant food per acre was and is being applied to the row under tomatoes and similar crops. Residues began to be built up which interfered with good root action. If the application of the fertilizer was followed by a heavy rain, the mortality of plants was reduced. If the plants were set in after the soil was cultivated but before a heavy rain, it was necessary to replant the crop.

About this time methods of applying fertilizers were questioned, and new methods were suggested. But in many of these methods, for some reason or other, the idea was to keep the fertilizer as close to the plant as possible without injuring the roots. Placing all the fertilizer under the row of plants resulted in a rapid growth if they escaped injury. If a season of ample rainfall prevailed, the plants grew soft and succulent, and in the case of the tomato made an extensive growth. They became crowded in the row and failed to set fruit until late in the season. There was much more foliage than was needed to produce a good crop of fruit. Very often collar rot or other disease-producing organisms set to work in the created shady, moist environment and killed the plants before they could mature their fruit. What should have been a 20-ton yield often turned out to be less than a ton to the acre.

Fertilizer Plowed Under

Cabbage grown under the same conditions made a tremendous yield, because foliage was what was needed for a marketable crop. Pritchard and Bonney Best tomatoes produced much larger yields under those conditions than did Rutgers or Marglobe. On the other hand Rutgers and Marglobe did much better during dry years when the fertilizer was not readily available to them.

Plowing under chemical fertilizers has not been adopted as a practice, and little research work has been done on it. Why shouldn't fertilizer plowed under produce as good yields as any other method of applying plant-food material? It is a method that can be used for most crops in any rotation. Furthermore, why should we apply so much quickly available plant food when we use chemicals? We never did it with manure, and we haven't gotten any better yields than we did with manure.

Row applications of any kind are conducive to poor distribution of plant food over a period of years. If the fertilizer was all used by the crop it would not matter, but we build a residue which is going to make good and poor spots in the field. Row application of fertilizer certainly does not lend itself to uniform growth in a rotation where heavy applications are made only once in 3 or 4 years. It reminds me of an alfalfa field I saw last spring in which the growth was good in regular 20-inch bands across the field interspersed with 2-foot bands on which very little alfalfa had started. Two years before, this field had been in melons for which the fertilizer had been placed under the row.

What seems to be even a greater objection to this surface application of fertilizer is the lack of penetration of phosphoric acid and lime. The phosphoric acid ties up in the before the surface soil is again turned under, and the lime has been neutralized and is no longer capable of correcting acidity when it is turned under. As a result our subsoils become poor media for root growth. Good crops can only be grown with healthy, vigorous roots. Now we find after years of applying fertilizer on the surface, that we have to use costly methods of subsoil conditioning to make our soils productive.

Need for Lime

Unfortunately less than 25 per cent of the farms in New Jersey have sufficient lime to grow good yields of vegetable crops. This probably is also true for the coastal plains States and other regions having humid climates. Phosphoric acid only becomes sufficiently mobile and thereby available to plants if there is sufficient lime in the soil to prevent aluminum and iron from coming into solution. As a result of continuous fertilization with chemical fertilizers carrying appreciable quantities of phosphoric acid and insufficient lime, there has been built up or accumulated an appreciable quantity of phosphoric acid for future use. This however is largely in the surface soil. The

addition of lime to such a soil will gradually release this stored phosphoric acid for plant growth.

A series of plots were established on a strongly acid soil to determine the value of different amounts of phosphoric acid on the tomato. The field was limed and plots were established which received 0, 4, 8, 12 on up to 20 per cent in a 5-0-10 mixture at the rate of 1,500 pounds per acre. The second year all the plots produced approximately 16 tons of tomatoes. The third year the plot receiving 5-0-10 produced almost as many tomatoes as did the highest yielding plot which received a 5-12-10 mixture. The third year there was a slight increase in yield up to 8% phosphoric acid.

Lime was put on each year, and the pH during the 3 years was increased from 5.4 to 6.7 on a sassafras loam soil. However, the fertility of these plots changed and phosphoric acid deficiency began to show in the plants on the plots which had not received any in the fertilizer. Things like this may lead us into erroneous conclusions as to the nutrient needs of the tomato. The quick soil tests showed no appreciable amount of phosphoric acid at any time on these plots, and yet we know that a 16-ton crop of tomatoes requires considerable phosphoric acid. It is a good story on the need for lime.

Had a subsoil liming experiment been established on this ground, the value of adding lime to the subsoil would have been demonstrated. Had this field been properly limed from the start, perhaps no method of fertilization would have shown any particular advantage. However, we have seen the initiation of a new practice, fertilizing the subsoil, which is bound to give results on many farms, because we neglected that subsoil in the past by placing all our fertilizer on top of the ground and neglected to use enough lime to keep the pH at 5.5 or above. Fertilizing the subsoil of course is a temporary procedure which we can eliminate by either plowing under lime and fertilizer or keeping our soils sufficiently well limed to make phosphoric acid more mobile in the soil.

Best Methods of Application

One is tempted to ask, "What is wrong with our research program?" Why have we gone off on a tangent and evolved various makeshift methods for growing vegetable crops, particularly where we can use sufficient liming materials? There is some justification for those crops which must be grown on acid soils because of disease. There we have to use special methods to make phosphoric acid available in spite of the presence of materials which are ready and waiting to tie it up.

There seem to be a number of ideas as to the best method of applying fertilizer, and we must come to some common understanding if we are going to make progress.

We have several fundamental things to settle before we can start to talk about methods of applying fertilizer. First of all, most crops have a lime requirement and aluminum tolerance that determine what the condition of the soil must be regarding acidity. This is probably one reason why we have not been successful in duplicating yields from manure plots with chemicals. There are wide differences in soil types, and methods of applying fertilizers should vary with these types.

In a survey of 135 tomato farms in New Jersey in 1939 the majority applied their fertilizer under the plants or sidedressed. Only two plowed under fertilizer.

Results from experiments with liming materials very definitely show that most crops will grow better with some lime, while others actually require an abundance of liming material. If that is the case, our methods for those crops should be worked out on soils that have sufficient lime to satisfy the crop. There seems to be little justification for working out a method on acid soil for a given crop, when the real need of the crop is lime.

Investigations have revealed certain advantages for different methods of applying fertilizers, and each probably has its place in the vegetable industry.

Broadcasting Fertilizer

This method consists of applying all the fertilizer on the surface after plowing and mixing it with the soil as the field is prepared for the crop. It is used for all shallow-rooted crops which are not cultivated, or for narrow-rowed crops that are cultivated with light tools. Very good results have been obtained with this method, particularly where some lime is added to the soil. The fertilizer is distributed sufficiently so that root injury does not occur. On acid soils the phosphorus will of course tie up rather quickly. However, crops grown in this manner should be grown on limed soils. The low yields would prohibit the use of acid soils. It is being used for wide-rowed crops on dairy farms with exceptionally good results.

The main disadvantage is leaching of the nitrogen and potash on light sandy soils during

(Continued on page 24)

April Tag Sales

Fertilizer sales in April, as indicated by the sale of tax tags, amounted to 1,183,000 tons in the 17 reporting states. This represented a 7 per cent decline from last year but total sales were moderately larger than two years ago.

Although six of the southern states reported increases over last year and six reported declines, the area as a whole showed a marked recession. There was a particularly sharp drop from last year in Mississippi tag sales, with more moderate declines in Virginia and the Carolinas. Declines in Alabama and Louisiana were small.

Sales in the midwestern region in April were well above last year, with increases in Indiana, Illinois, and Kansas more than offsetting declines in Kentucky and Missouri. Sales were smaller than two years ago, however.

January-April sales in the south were a little under the corresponding period of 1939, though 2 per cent above 1938. Virginia and North Carolina have experienced the largest sales losses, probably reflecting the decline in tobacco acreage. Pronounced increases have taken place in Arkansas and Texas.

Kentucky is the only one of the five states in the midwest to show a drop in January-April sales and the decline there is very moderate. For the region as a whole sales have been 16 per cent above January-April, 1939.

Economic conditions have been generally favorable to an increase in fertilizer tonnage this year. In the first quarter of the year farm cash income was 12 per cent larger than in 1939. Such an increase in farm purchasing power would normally result in an increase in fertilizer sales.

Price relationships have also been favorable to increased fertilizer use. The U. S. Department of Agriculture has reported that the price paid by farmers for fertilizer in April was 98 per cent of the 1910-1914 average. This was lower than the price index for any other group of commodities bought by farmers. All commodities bought are 23 per cent above pre-war, on the average. Prices farmers receive for their products are 98 per cent of pre-war, so farm parity has been restored as far as fertilizer is concerned. In relation to all commodities, however, farm prices are still 20 per cent below parity.

The stimulating effect of farm purchasing power and favorable price relationships on fer-

FERTILIZER TAX TAG SALES*

Compiled by The National Fertilizer Association

	April				January-April			
	1940		1939	1938	1940		1939	1938
	Per Cent of 1939	Tons	Tons	Tons	Per Cent of 1939	Tons	Tons	Tons
SOUTH:								
Virginia†	89	80,608	90,905	82,548	92	248,391	270,098	270,075
N. Carolina	88	326,244	371,434	307,141	88	884,556	1,005,967	933,648
S. Carolina	84	145,278	173,192	102,836	101	589,658	584,871	565,881
Georgia	111	178,641	160,368	133,105	107	657,524	615,153	637,971
Florida†**	182	38,037	20,911	32,645	113	214,044	188,900	210,454
Alabama	99	193,050	195,800	177,700	102	506,000	497,400	456,600
Mississippi	38	45,257	117,775	118,223	94	241,270	257,375	273,354
Tennessee†	119	52,772	44,493	45,615	101	92,454	91,954	92,854
Arkansas‡	165	19,750	12,000	13,750	137	85,950	62,900	57,000
Louisiana†	90	25,100	27,751	14,255	105	127,411	120,801	114,172
Texas†	116	20,540	17,640	11,657	127	97,556	76,674	68,044
Oklahoma	...	120	10	270	88	5,293	6,028	6,385
Total South	91	1,125,397	1,232,279	1,039,745	99	3,750,107	3,778,121	3,686,438
MIDWEST:								
Indiana	129	22,357	17,313	25,769	121	135,376	111,608	95,145
Illinois	366	14,129	3,862	10,159	134	26,636	19,888	21,953
Kentucky	91	18,983	20,815	31,407	96	59,094	61,823	75,627
Missouri	91	1,882	2,062	450	123	25,708	20,827	24,668
Kansas	...	285	5	455	201	2,653	1,320	3,484
Total Midwest	131	57,636	44,057	68,240	116	249,467	215,466	220,877
Grand Total	93	1,183,033	1,276,336	1,107,985	100	3,999,574	3,993,587	3,907,315

* Monthly records of fertilizer tax tags are kept by state control officials and may be slightly larger or smaller than the actual sales of fertilizer. The figures indicate the equivalent number of short tons of fertilizer represented by the tax tags purchased and required by law to be attached to each bag of fertilizer sold in the various states.

† Cottonseed meal sold as fertilizer included.

‡ Excludes 16,600 tons of cottonseed meal for January-April combined, but no separation is available for the amount of meal used as fertilizer from that used as feed.

** Includes 14,965 tons of phosphatic and lime materials for January-April.

tilizer consumption, however, has been nullified by the adverse weather and the reduction in tobacco acreage. The lateness of the season has tended to reduce sales. The prospective reduction of 418,000 acres, or 21.5 per cent, in the 1940 tobacco crop has naturally affected fertilizer sales in the tobacco states. In Virginia the decline is 44,000 acres, or 26 per cent; in North Carolina it is 252,000 acres, or 31 per cent; in South Carolina it is 42,000 acres, or 30 per cent.

INTERSTATE C. F. A. RATES TO BE CUT

The Interstate Commerce Commission has modified its order in the C. F. A. Rate Case on fertilizers and fertilizer materials, I. C. C. 28063, so as to permit the filing and posting, on five days' notice, of the reduced rates ordered to be made effective on or before May 28, 1940. In this case, which was instigated by the Traffic Committee of the N. F. A., the Interstate Commerce Commission not only refused to grant increases in interstate rates within C. F. A. territory, but found the present rates unreasonable and ordered them to be reduced not later than May 28 to rates not more than 10 per cent higher than the rates effective December 19, 1937.

March Superphosphate Production

Superphosphate production in each of the past seven months has been larger than in the corresponding month of the preceding year. March output at plants which report to The National Fertilizer Association was 16 per cent larger than a year ago and 11 per cent larger than two years ago. It was well below 1937, however, which marked the peak in recent years. The decline in production from February to March was a little less than usually occurs at that season. Aggregate production at reporting plants in the first three months of the current year, from January through March, totaled a little over a million tons, an increase of about 25 per cent over the same period of last year. The increase for this period in the north was 26 per cent, while southern acidulators reported a 23 per cent rise.

The decline in superphosphate stocks during March was smaller than the usual seasonal drop. This reflected the comparatively large output and the failure of shipments to show as relatively large an increase. Stocks of bulk superphosphate at the close of March were slightly larger than a year earlier while stocks in base and mixed goods were substantially larger than at the end of March, 1939. Total stocks were also higher than two years ago. Reported stocks of base and mixed goods as of March 31st were the largest for the date since 1931. The peak in bulk stocks in recent years was in 1937.

Superphosphate Production, Shipments and Stocks for March and January-March, 1940 and 1939

Expressed Throughout in Equivalent Tons of 16% A.P.A. Based on Reports by Acidulators to The National Fertilizer Association

March	United States 1940	United States 1939
Stocks—First of month:		
Bulk superphosphate	1,073,020	1,108,451
Base & mixed goods	933,263	839,769
Production:		
Bulk superphosphate	284,671	245,007
Base & mixed goods	12,127	10,216
Total Production	296,798	255,223
Other receipts*	27,912	20,149
Book adjustments	—2,009	—1,122
Total Supply	2,328,984	2,222,470
Shipments:		
Superphosphate:		
To mixers	183,642	165,267
To other acidulators	35,539	41,653
To consumers, etc.	135,383	139,490
Total Superphosphate	354,564	346,410
Base & mixed goods	239,757	260,684
Total Shipments	594,321	607,094
Stocks—End of month:		
Bulk superphosphate	952,512	948,853
Base & mixed goods	782,151	666,523
Total Stocks	1,734,663	1,615,376

Accumulated Production and Shipments for January-March

	United States 1940	United States 1939
Production:		
Bulk superphosphate	970,480	775,002
Base & mixed goods	36,909	29,671
Total Production	1,007,389	804,673
Shipments:		
Superphosphate:		
To mixers	392,563	341,065
To other acidulators	125,013	115,015
To consumers, etc.	203,622	211,745
Total Superphosphate	721,198	667,825
Base & mixed goods	355,959	385,517
Total Shipments	1,077,157	1,053,342

* Includes inter-company transfers.
Base includes wet and/or dry base.

Potash Extraction From Sea-Water*

A Novel Norwegian Process

IF a process now under development in Norway, and which has already reached the pilot-plant stage, lives up to the expectations of its sponsors, the international potash situation would appear to be on the eve of a veritable revolution. Hitherto, although those countries devoid of natural resources of soluble potash in the form of mineable deposits, such as occur in France, Germany, Poland, Spain, Russia and New Mexico, have been successful in numerous instances in recovering the potash values of inland lakes or of the waters of salines, no method has been available for the recovery, economically, of the comparatively low potash content of open sea-water.

Dipicrylamine as the Precipitant

It has been recognized that such a process is most likely to follow the discovery of a precipitant having a selective action for potash among all the soluble constituents of sea-water, and capable of producing a complex from which the potash can be recovered and the precipitant regenerated for re-use in the process. Such a precipitant, by the use of which over 70 per cent of the potash content of sea-water containing 0.4-0.45 kg. of K_2O per cubic meter, can be recovered, has been discovered by the Norsk Hydro Elektrisk Kvaelstof A. S. The precipitant in question is dipicrylamine (hexanitrodiphenylamine), and particulars in regard to its properties and uses for potash-recovery purposes are given by the company in the specification of their patent No. 22,025, which recently became open to public inspection under the International Patents Convention.

According to the document in question, the possibility of the technical realization of the recovery process is based, among other things, upon the discovery that the practically water-insoluble potassium dipicrylaminate may be brought to react directly with acid in such a manner that the potassium, combined with the acid, goes into solution, while insoluble dipicrylamine remains in the form of substantially unaltered crystals. The process is of particular advantage for the treatment of sea-water, since all the metals except potassium, which are present in the form of dissolved salts in the sea-water, form readily soluble compounds with dipicrylamine. The use as precipitant, of the calcium salt of dipicrylamine is preferred, although use may also be made of the sodium, lithium or magnesium salts. It has been found advantageous to work without substantial excess, or even with a slight deficiency, of dipicrylaminate calculated with reference to the total potassium content of the sea-water to be treated. After separating the percipitated crystalline mass, the solution is acidified to decompose any excess of precipitant, after which the insoluble dipicrylamine is recovered by filtration. It has been found advantageous to carry out this precipitation of the excess reagent in separate stages, to obtain crystals suitable for filtration.

It has been found, says the specification, that the best procedure is as follows: To the slightly alkaline solution obtained after the precipitation of the potassium dipicrylaminate, there is added a dilute acid in consecutive steps and in such a manner that the solution for a certain period after each step has a predetermination degree of acidity and a predetermined concentration of dissolved dipicrylamine. The degree of acidity at the last step should be approximately pH 3 to 4, and it has been found that propitious conditions of precipitation are achieved when the pH is changed approximately 1 unit or less per each step after precipitation has commenced. The dilution of the acid to be used for precipitation is preferably carried out by means of suspension or filtrate from a previous process of precipitation.

Recovery of the Organic Reagent

In the decomposition of the potassium dipicrylaminate by nitric acid, the best results are obtained with acid of a concentration not exceeding 20 per cent and at a temperature not exceeding 30° C., or with acid of concentration of 40-50 per cent at temperatures above 80° C. If sulphuric or hydrochloric acid is used for the decomposition, it has been found preferable to use comparatively high acid concentrations and comparatively high temperatures in order to avoid precipitation of the potassium salt formed. The practicability of using acetic acid for the decomposition stage, with the resultant formation of potassium acetate, has also been demonstrated, while by the use of carbon dioxide under pressure, potassium carbonate is produced.

According to an example given in the specification, 420 grams of dipicrylamine was dis-

(Continued on page 22)

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To Keep Youth on the Farm

Industry has extended a helping hand to farm youth in the establishment of the National Farm Youth Foundation in Dearborn, Michigan. Educational courses in farm management and engineering, as well as practical training in the operation of modern farm equipment, will be made available at once to at least 20,000 young men on American farms, between the ages of 18 and 25.

The Foundation has been created by the Ferguson-Sherman Manufacturing Corporation, with the active cooperation of Henry Ford, founder and Edsel Ford, president of the Ford Motor Company.

"Young men of the farm have not realized their opportunities on the home soil," said Henry Ford in announcing his participation in the Foundation, "and young men of the city have not appreciated the career a farm offers. As a result, farming has been neglected.

"The family system of farming has suffered and we want to see it re-built. As a matter of fact, the Foundation seeks to help the young man of the farm to realize his aspirations for happiness and prosperity.

"I am told that eighty per cent of the graduates of agricultural colleges seek their careers in cities instead of returning to the farm. The remaining 20 per cent are not enough to give the farm the trained leadership it needs for agricultural progress.

"Better farming methods to-day will mean better farms to-morrow and rural youth will be more inclined to stay close to the soil."

Jobs will go to 58 of the scholarship students and hundreds more will find places in industry and business associated with farming, according to announced plans.

The first 29 awards are contracts under which the students selected will be employed a year at the Ferguson-Sherman plant in Dearborn at a salary of $150 a month. The next 29 students will receive one-year contracts to work with the company's distributors at $125 a month. An additional 725 will be placed on an honor roll for first selection as other openings occur in plant and offices of the company, its distributors and dealers. The primary objective is to train young men so that they may become proficient, and experienced, in solving the problems common to the business concerns and the farm operators of the local community.

The Foundation will carry rural youth beyond the age limit of 4-H Clubs (21 years) and also well beyond the Smith-Hughes vocational agriculture high schools which provide excellent training and education.

DELIVERIES OF POTASH SALTS JANUARY - MARCH

The American Potash Institute, Inc., has announced that deliveries of agricultural potash by its Member Companies within the continental United States, Canada, Cuba, Puerto Rico, and Hawaii during the first quarter of the calendar year 1940 amounted to 70,462 tons of actual K_2O, equivalent to 122,929 tons of potash salts. Constituting this total were 112,556 tons of muriate, 3,860 tons of manure salts, and 6 513 tons of sulphate. In addition, deliveries for chemical uses amounted to 13,629 tons of salts equivalent to 8,450 tons of K_2O. These figures include salts of domestic origin only. Based on import records of the Bureau of Foreign and Domestic Commerce potash imports during the first quarter amounted to approximately 64,803 short tons K_2O.

In terms of regional consignments, the total of 63,087 tons K_2O delivered within the continental United States was shipped as follows: Southern states (including Virginia), 34,584 tons; Mid-Western states, 13,081 tons; Northeastern and Mid-Atlantic states, 13,089 tons; and West Coast states, 2,333 tons. The balance of 7,375 tons K_2O was delivered to Canada, Cuba. Puerto Rico and Hawaii.

CHART ON PLANT FOOD UTILIZATION

In connection with an article "When Fertilizing, Consider Plant-Food Content of Crops" by J. D. Romaine, recently published in "Better Crops with Plant Food," the American Potash Institute, Inc., Washington, D. C., has issued a chart showing graphically the amounts of nitrogen, phosphoric acid and potash contained in the total plant per acre with good acre yields, for 20 of the principal crops of this country. Nitrogen ranges from 25 pounds per acre for grapes to 140 pounds for alfalfa; phosphoric acid runs from 10 pounds per acre for grapes and apples to 65 pounds for celery; potash ranges from 35 pounds per acre for grapes and apples to 235 pounds per acre for celery. The chart measures 16 x 22 inches and is attractively printed in four colors.

CHILEAN NITRATE ISSUES INDEX SUPPLEMENTS

To bring up to date the 3rd Edition of the Bibliography of References to the Literature on the Minor Elements, which was published in February, 1939, the Chilean Nitrate Educational Bureau has issued a supplemental booklet listing all references and abstracts from that date to January 1, 1940. Over 600 articles are summarized, with alphabetical and botanical indexes.

The Bureau has also issued a 24-page Botanical Index to the 3rd Edition of the Bibliography, grouping the references under the various agricultural products on which the various articles treat.

Copies of these two supplements will be sent to any member of the fertilizer industry on request to the Chilean Nitrate Educational Bureau, 120 Broadway, New York City.

TVA SUPERPHOSPHATE IN INDIANA

A release from Purdue University quotes their Extension Service to the effect that a total of 408,900 pounds of TVA 45 per cent superphosphate had been shipped to Indiana. One farm in each of 37 counties is to receive this material for "Farm Unit Test Demonstrations." The release further says "ordinary phosphate carries little more than 16 per cent" ("available phosphatic plant food").

Such demonstrations in Indiana seem unnecessary, and the release seems to be misleading as to facts, for Indiana farmers in 1939 purchased 500 tons of concentrated superphosphate, 10,250 tons of 20 per cent superphosphate, and only 1,531 tons of 16 per cent superphosphate.

THE GREENBRIER, WHITE SULPHUR SPRINGS, W. VA.

Scene of the National Fertilizer Association Annual Convention, June 3, 4 and 5, 1940

EXPORTS AND IMPORTS DURING MARCH

Continuing the decline which began last fall, March export tonnage was less than half as large as a year ago and about one-third as large as two years ago. Shipments of fertilizer and fertilizer materials during the month totaled 60,332 long tons with a stated valuation of $884,283. The decline in value was not as great as that in tonnage since there was an increase in exports of nitrogenous materials, with a relatively higher value per ton. Most of the phosphate rock exported in March went to Sweden, with the remainder going to Italy and Japan. Potash exports were again low, with Canada taking most of the small quantity exported.

Exports of nitrogenous materials in the January-March period were the largest for any first quarter since 1935. Most of the increases in the group was in ammonium sulphate. Exports of phosphate rock and potash were the lowest in many years. Superphosphate was exported in larger quantity than in recent years, as were also fertilizer mixtures.

March fertilizer imports amounted to 181,636 long tons valued at $3,737,234. Tonnage was well above last year but somewhat less than two years ago. Principal changes in the nitrogenate group, compared with a year ago, were: a sharp increase in sodium nitrate; smaller increases in cyanamid and ammonium phosphates; declines in ammonium sulphate, ammonium nitrate mixtures, calcium nitrate and natural organics. Imports of all nitrogenous materials were 21,000 tons larger than in March, 1939. Potash imports in March were much higher than in recent years. Sharp increases were shown in muriate, kainit and sulphate. France was the principal supplier of potash salts; 50 tons of muriate were reported as coming from Belgium.

Total imports in the first quarter were substantially larger than last year although less than in 1938. In the nitrogenate group increased imports of sodium nitrate, cyanamid and ammonium phosphates were more than offset by declines in other materials. Potash imports were more than three times as large as last year.

"GREEN ACRES" IN DEMAND

With 872 reported showings, the total attendance at "Green Acres," the film produced by the National Fertilizer Association, to date has been 63,289 people. One copy was shown 38 times in West Virginia to 1,719 farm people. One member who purchased a copy in January reports that it has been shown 42 times to 4,607 people. A copy presented to North Carolina State College of Agriculture for cooperation in producing the picture has been shown to 3,000 people. The demand for the film continues. The educational units of the Agricultural Adjustment Administration for Pennsylvania are using one copy at present for farmer's meetings and have asked for a second copy to meet the demand for its use during the summer. The Soil Conservation Service is using copies in several regions and has been promised a copy for use in the Pacific Northwest when one is available.

PHOSPHATE COMMITTEE CONTINUED

On April 22nd, the Senate passed Joint Resolution 199, extending to January 14, 1941, the date when the Joint Committee to Investigate the Adequacy and Use of Phosphate Resources of the United States must report to the Congress. This extension of time will permit the Committee to conclude its hearings and investigations and make its report to the next Congress.

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

AGENTS - IMPORTERS - BROKERS

155 E. 44th Street NEW YORK

BRANCHES

Clinton St. & Danville Ave. Baltimore, Md.

505 Royster Building Norfolk, Va.

505 Barnett Bank Building Jacksonville, Fla.

FERTILIZER MATERIALS MARKET

NEW YORK

Fertilizer Shipments Continuing Except in South. Little Current Demand for Most Materials. Prices for Next Season on Sulphate of Ammonia Awaited.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, May 7, 1940.

Activity in the fertilizer business is quite general throughout the country, except in the south where the shipping season is about over.

Demands for raw materials for the fertilizer trade have been very slight and there are ample supplies of all materials with the exception of sulphate of ammonia.

Sulphate of ammonia continues scarce, with certain demands for export still in the market, but it is quite likely supplies will build up within the next month or so. The principal interest in sulphate of ammonia today seems to be the question as to what the schedule price will be for the new season but no indication has been given as yet by manufacturers or their agents.

Nitrate of Soda

Shipments have not been as heavy as expected, with the prices firm at schedule of $27.00 in bulk, $28.30 in 200-lb. bags and $29.00 in 100-lb. bags, port basis.

Potash

This market remains unchanged, with ample supplies available at schedule of 53½ cents per unit K_2O in bulk, basis ex vessel.

Superphosphate

This market is firm at $8.50 per ton for run-of-pile material for domestic use.

Fish Scrap

This market has advanced and some small sales have been reported at $3.50 ($4.25½ per unit N) and 10 cents.

Nitrogenous Material

With considerable material for the new season having been taken off the market, due to booking of contracts, the market is a trifle firmer. With the present price of $2.00 to $2.20 ($2.43 to $2.67½ per unit N), delivered ports, for domestic material, it seems unlikely that any considerable quantities of foreign material will be brought in.

Dried Blood

This market is unchanged and South American is still available at $2.85 ($3.46½ per unit N).

Castor Pomace

Ample stocks are in hand and $2.35 ($2.85½ per unit N) can still be done.

Triple Superphosphate

Demand continues for this material, with the U. S. Government calling for further quantities. It is unlikely that price for the new season will be available until probably about June 15th.

ATLANTA

Shipping Season About Completed. Tonnage Expected to Equal 1939 Level. Use of Fertilizers Pays Notable Returns.

Exclusive Correspondence to "The American Fertilizer."

ATLANTA, May 6, 1940.

Early May sees the fertilizer shipping season in this section of the South rapidly drawing to a close. Producers in this area, whom we have interviewed, seem to feel that this week will see the end of the delivery period except a few scattering fill-in shipments.

It is too early to estimate with any degree of accuracy what the total consumption will be but apparently the tonnage will not be less than last year and may probably show a slight increase.

A recent bulletin from the National Association indicates that Georgia farmers spent $19,305,000 for fertilizer last year. The extra return which they received from its use amounted to $66,733,000, leaving an increased income above the cost of the fertilizer of $47,428,000. In other words, for every dollar

A Complete Service

THE strategic factory locations of the American Agricultural Chemical Company, as shown on the accompanying map, assure prompt, dependable service for the complete line of products listed below.

We manufacture all grades of Commercial Fertilizers, Superphosphate, Agrinite Tankage, Bone Black, Bone Black Pigments (Cosmic Black), Dicalcium Phosphate, Monocalcium Phosphate, Gelatin, Glue, Ground Limestone, Crushed Stone, Agricultural Insecticides (including Pyrox, Arsenate of Lead, Calcium Arsenate, etc.), Trisodium and Disodium Phosphate, Phosphorus, Phosphoric Acid, Sulphuric Acid, Salt Cake; and we are importers and/or dealers in Nitrate of Soda, Cyanamid, Potash Salts, Sulphate of Ammonia, Raw Bone Meal, Steamed Bone Meal, Sheep and Goat Manure, Fish, Blood and Tin-Tetrachloride. We mine and sell all grades of Florida Pebble Phosphate Rock.

FACTORIES

Alexandria, Va.	Detroit, Mich.	Pierce, Fla.
Baltimore, Md.	East Point, Ga.	Port Hope, Ont., Can.
Buffalo, N. Y.	East St. Louis, Ill.	Presque Isle, Me.
Carteret, N. J.	Greensboro, N. C.	Savannah, Ga.
Cayce, S. C.	Henderson, N. C.	Searsport, Maine
Chambly Canton, Quebec, Can.	Montgomery, Ala.	South Amboy, N. J.
	Norfolk, Va.	Spartanburg, S. C.
Charleston, S. C.	No. Weymouth, Mass.	West Haven, Conn.
Cincinnati, Ohio	Pensacola, Fla.	Wilmington, N. C.
Cleveland, Ohio		Havana, Cuba

The AMERICAN AGRICULTURAL CHEMICAL Co.

50 Church Street, New York City

SALES OFFICES

Alexandria, Va.	Columbia, S. C.	Laurel, Miss.	Pierce, Fla.
Baltimore, Md.	Detroit, Mich.	Montgomery, Ala.	Port Hope, Ont.
Buffalo, N. Y.	East Point, Ga.	Montreal, Quebec, Can.	Savannah, Ga.
Carteret, N. J.	East St. Louis, Ill.	New York, N. Y.	Spartanburg, S. C.
Charleston, S. C.	Greensboro, N. C.	Norfolk, Va.	St. Paul, Minnesota
Cincinnati, Ohio	Henderson, N. C.	No. Weymouth, Mass.	Wilmington, N. C.
Cleveland, Ohio	Houlton, Me.	Pensacola, Fla	Havana, Cuba

THE AMERICAN AGRICULTURAL CHEMICAL COMPANY · AA QUALITY ·

spent for fertilizer, the farmer received an average return in increased yields of $3.46.

The market on materials is as follows:

Tankage.—Imported, $3.10 ($3.77 per unit N) and 10 cents; domestic, $2.50 ($3.04 per unit N) and 10 cents Chicago.

Nitrogenous.—$1.75 ($2.12½ per unit N), western producing points; foreign, $2.25 $2.73½ per unit N) c.i.f.

Blood.—Imported, $3.00 ($3.64½ per unit N); domestic, $2.70 ($3.28 per unit N), basis f.o.b. Chicago.

Nitrate of Soda.—Heavy movement with no change in price.

Sulphate of Ammonia.—Some resales cropping up, indicating that the peak demand has been passed.

Fish Meal.—Menhaden, nothing offering. Foreign fish meal, $52.00, the ports.

Raw Bone Meal.—4½ and 45 per cent, $31.50.

Steam Bone Meal.—$30.00.

Cottonseed Meal.—Prime 8 per cent, $30.00, Memphis,; southeastern mills, $31.50 to $32.00.

BALTIMORE

Middle Atlantic Shipping Season in Full Blast. Materials Market Dull. New Fishing Season Opens at High Level.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, May 7, 1940.

The fertilizer shipping season got under way in full blast during the past two weeks, and with continuation of favorable weather conditions manufacturers hope that the season will run throughout the entire month of May.

Ammoniates.—The market on feeding tankage continues firm at about $3.30 per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. Baltimore. The demand, however, is light.

Nitrogenous Material.—There is practically no interest in this product which continues nominal at $2.90 per unit of nitrogen.

Sulphate of Ammonia.—There has been an improvement in shipments from the mills, now that the heavy demand from the south is over, although this commodity is still scarce and resale lots are unobtainable except at prices $5.00 to $6.00 per ton over the schedule.

Nitrate of Soda.—There has been a fairly good seasonal demand and the market continues unchanged for both the imported and domestic productions, at $29.00 per ton of 2,000 lb., in bags, f.o.b. port warehouse, with usual differential in 200-lb. bags and in bulk.

Fish Scrap.—It is reported further sales have been made at an advance of 25 cents per unit of ammonia, making price $4.25 per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. fish factories, for shipment "if and when made." This is about on par with the market last year, and compares favorably with the market on imported fish meal. Fish meal guaranteed 55 per cent protein is still quoted at $58.00 per ton of 2,000 lb., f.o.b. Baltimore.

Superphosphate.—There is no change in the market, and manufacturers continue to quote run-of-pile at $8.50 per ton of 2,000 lb., basis 16 per cent and $9.00 per ton for flat 16 per cent grade, both in bulk, f.o.b. Baltimore.

Potash.—There is nothing new in the situation as, between importers and domestic manufacturers, there has been sufficient tonnage to see manufacturers through for the present season.

Bone Meal.—This material continues scarce and 3 and 50 per cent steamed bone meal ranges from $32.00 to $35.00 per ton, with 4½ and 47 per cent South American raw bone meal continues to be quoted from $30.00 to $32.00 per ton, c.i.f. Baltimore.

Bags.—The market on burlap is slightly

Manufacturers' Sales Agents for **DOMESTIC**

Sulphate of Ammonia

Ammonia Liquor :: Anhydrous Ammonia

HYDROCARBON PRODUCTS CO., INC.

500 Fifth Avenue, New York

NATURAL CHILEAN
Nitrate of Soda

Old Style and Champion
Both Guaranteed
16% NITROGEN

•

Valuable not only as a source of nitrogen, but also to help maintain the supply of other plant food elements *naturally* blended with it.

Natural Chilean Nitrate of Soda is the only natural nitrate in the world. It's *always reliable*.

CHILEAN NITRATE Sales Corporation

120 BROADWAY, NEW YORK
RALEIGH, N. C. ATLANTA, GA. JACKSON, MISS.
MONTGOMERY, ALA. COLUMBIA, S. C.
LOS ANGELES, CALIF.

higher, and the present price is about $114.00 per thousand for plain, new, 10-oz. bags, basis 40 cut 54 in., delivered Baltimore.

CHICAGO

Little Change in Fertilizer Materials Market. Buyers and Sellers Waiting Developments. Feed Market Firm.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, May 6, 1940.

No change has occurred in this market. Sellers, after their recent sales, continue being fairly firm in their views, and are expressing confidence in future prices. Many buyers, however, have contrary ideas as to organics; so, at present, its anyone's guess as to the course of the future market.

The feed market in tankage and blood is firm, with supplies narrow. For the time being, most buyers are disinclined following higher asking prices.

Nominal prices are as follows: High-grade ground fertilizer tankage, $2.40 to $2.50 ($2.91½ to $3.04 per unit N) and 10 cents; standard grades crushed feeding tankage, $3.25 to $3.35 ($3.95 to $4.07 per unit N) and 10 cents; blood, $2.90 to $3.00 ($3.52½ to $3.64½ per unit N); dry rendered tankage, 72 to 75 cents per unit of protein, Chicago basis.

TENNESSEE PHOSPHATE

Fertilizer Shipments Heavy, but Price Cutting is Prevalent. More Bulk Shipments of Ground Rock.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., May 5, 1940.

With a cold spell for May Day that brought flurries of snow, the spring winters seem to be about over and beautiful, almost warm weather is on tap at the present writing. Spring growth which has been very backward is now booming.

Fertilizer shipments are showing heavy movement in every direction, with reports of price cuttings in all sections, still largely attributable to the AAA grants in aid in the purchase of superphosphate against benefit payments.

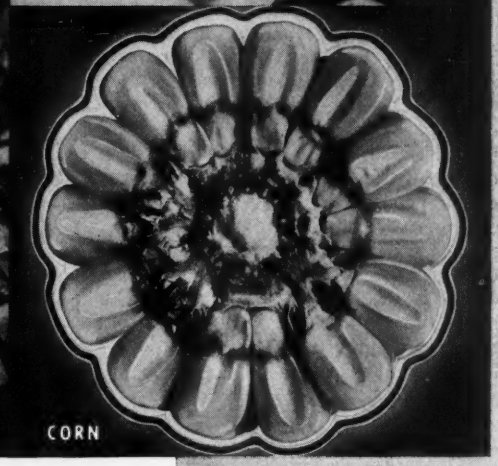
Of course, if the price cutters stopped to realize that no amount of lowering price would compete with free fertilizer, there need not have been any price cutting at all. If the grant-in-aid material was being used legally only on pasture and soil building crops, it

SUNSHINE STATE POTASH

FOR SPRING PLANTING

COTTON

TOBACCO


CORN

IN the Spring, a farmer's thoughts turn to planting crops. And the first step in the growing of quality and quantity crops is an adequate use of proper grade fertilizer containing the right quantity of Potash.

Cotton, corn, and tobacco, as well as many other crops, are benefited by fertilizer containing Sunshine State Potash, specified to fit local conditions of soil and climate.

Fertilizer producers know the right formula for the right job. They like Sunshine State Potash because of its consistently uniform analyses of Muriate of Potash and Manure Salts, and the careful sizing that makes handling and blending easy.

HIGRADE MURIATE of POTASH
62/63% K_2O Also 50% K_2O Grade

MANURE SALTS
Approximately 30% K_2O

REG. U. S. PAT. OFF.

SUNSHINE STATE POTASH U.S.A. PRODUCT OF NEW MEXICO

UNITED STATES POTASH COMPANY
INCORPORATED
30 Rockefeller Plaza, New York, N. Y.

would not come in competition with 95 per cent of the ordinary commercial fertilizer sold.

If as alleged, most of the grant-in-aid material is actually being used on soil-depleting row crops, and will earn no benefit payments, then it will not cost the farmer anything, and that cost cannot be competed with by cuts.

Effort is being made to have a meeting of the American Institute of Mining and Metallurgical Engineers of the Southeast Section in the phosphate area June 21st and 22nd, with opportunity to visit mines and plants of the industry, and an evening dinner meeting with papers on the geology and mining of the industry, milling and flotation, and possibly some high lights on the electric furnaces of the area or of Muscle Shoals.

Another ten per cent advance is announced on paper bags as a result of Scandanavian war conditions, which will amount to about 10 cents per ton of ground rock, and no certainty can be had as to future course of these prices.

It is noticeable that more ground rock is being shipped in bulk than formerly, partly due to the January 1st advance in bags, and partly due to more contract spreading being done in the corn belt, where truckers take the phosphate direct from the cars and spread it on the fields. When these truckers become experienced in handling phosphate and have enough regular business to justify having proper equipment, there is only a small part of the waste from bulk handling which occurs with the average farmer only handling a small lot once a year. April, 1940, witnessed the maximum ground rock shipments of any April in ten years.

A NEW LINK-BELT CATALOG ON STOKERS

A new 8-page, tabloid size, rotogravure catalog No. 1782 on automatic coal stokers, has just been issued by Link-Belt Company, 2410 W. 18th Street, Chicago, dwelling on the method and advantages of stoker firing, and particularly stressing the Link-Belt "Magic Flame" combustion principle.

It covers the company's line of domestic bituminous stokers, both hopper type and bin-fed; anthracite models, hopper and bin-fed types, with or without ash removal; and commercial and industrial bituminous stokers for boilers up to 300 H. P. Data on the company's background and manufacturing facilities are also given.

This catalog is furnished free to stoker dealers and distributors, for use in local advertising and personal selling.

Copies may be obtained by addressing Link-Belt Company.

$1,000 PRIZE GARDEN BOOK COMPETITION

The Macmillan Company announces a Competition for the best garden book manuscript by an author who has not published a garden book previously. The award will be $1,000.00; $500.00 of which will be an outright payment, and $500.00 an advance against royalties.

The competition will close November 30, 1940, and the award will be announced January 2, 1941. The final judges of the contest will be Carol Fleming, Channel Bookshop, New York City; Elizabeth Hall, Librarian, New York Botanical Garden; and H. S. Latham, Vice President and Editor of The Macmillan Company.

Brochures giving the conditions of the contest, together with entry blanks, may be secured from Prize Garden Book Competition, The Macmillan Company, 60 Fifth Avenue, New York.

PULVERIZED
MASCOT
LIMESTONE
Trade Mark Registered

MAGNESIUM LIMESTONE
"It's a Dolomite"
American Limestone Company
Knoxville, Tenn.

Urea Combines the Best Qualities of Both Soluble and Insoluble Forms of Nitrogen

Urea Nitrogen Is Quickly and Completely Available

Quick-acting for early growth of seedlings and young plants.

It Is Resistant to Leaching

Urea resists leaching during the early stages of growth, when the young plants are absorbing little nitrogen. Thus, it is available to the crop later in the season, when the demand for nitrogen is the greatest.

It Is Low in Equivalent Acidity

In its final effect, Urea is only slightly acidic, having almost exactly the same acidifying action as dried blood and cottonseed meal when figured on the basis of equal amounts of nitrogen. It requires only small amounts of dolomite to make it completely non-acid-forming. In fact, Urea leaves no undesirable or harmful residues of any kind.

What More Could You Ask?

So, you will note that Urea Nitrogen, a water-soluble organic form, combines the completely and readily available qualities of the soluble forms with the low-acidity and leaching-resistant qualities of the natural insoluble organics.

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CORPORATION PROFITS

There was a marked improvement of earnings in most lines of business in 1939, following the slump in 1938, and reflecting the sharp increase in industrial production and trade which took place last year. A tabulation made by the National City Bank of New York of the published statements of 2,480 companies representing all major lines of business shows combined net profits, after taxes and less deficits, of approximately $3,456,000,000. This compares with a total of $2,119,000,000 for the same companies in 1938, when earnings in most lines were relatively low and large numbers of companies operated at a deficit.

Total net profits of 1,440 corporations engaged in manufacturing rose from $1,068,000,000 to $1,938,000,000, an increase of 81.5 per cent. These companies represent 42 different industries. Improvement in earnings from 1938 to 1939 was shown by 39 of these groups and declines in earnings by only 3. Distilling companies had a 5.0 per cent decline and a 21.6 per cent drop occurred in profits of agricultural implement manufacturers. The fertilizer industry was at the bottom of the list. The 8 fertilizer companies included in the tabulation had aggregate net profits of $2,782,000 in 1938 and $1,777,000 in 1939, a drop of 36.1 per cent.

Net worth of the 1,440 manufacturing corporations, comprising capital, surplus and undivided profits, totaled $22,916,148,000 at the beginning of 1939. The ratio of the net profits for the year to net worth was 8.5 per cent, a substantial improvement over 1938 when the ratio was 4.6 per cent. Net worth of the 8 fertilizer companies was $81,561,000 on January 1, 1939 compared with $80,744,000 a year earlier. Net profits were only 2.2 per cent of net worth in 1939 and 3.4 per cent in 1938.

FIRST FERTILIZER SHORT COURSE AT LAFAYETTE, LOUISIANA

The College of Agriculture of the Southeastern Louisiana Institute announces that a successful Fertilizer Short Course was held on February 17th, under direction of Dr. H. J. Wilson, Associate Professor of Soils. The program included talks by J. M. Jenkins, Superintendent of the Rice Experiment Station; C. B. Goaux, Cane Specialist of the Louisiana Experiment Station; Dr. D. M. Seath, in charge of Dairy Research of the Louisiana Experiment Station; and several representatives of the industry. The meeting was so successful that it was decided to make it an annual conference.

POTASH EXTRACTION FROM SEA-WATER

(Continued from page 11)

solved in 8 liters of milk of lime, with a calcium oxide content of 27 grams. The solution was filtered and added to 100 liters of sea-water containing about 73 grams of potassium chloride, while stirring, at 16-18° C. A red crystalline mass separated out, was filtered after fifteen minutes, and washed with water. The filter cake, of which 78 per cent was potassium dipicrylaminate, the balance being water, weighed 435 grams. This filter cake was then treated, while stirring at 20° C., with 270 cc. of 14 per cent nitric acid for about three-quarters of an hour. After filtration and washing, the quantity of potassium nitrate in the solution corresponded to a conversion of 93 per cent of the nitric acid used, but, with a systematic treatment of the salt with nitric acid, practically complete conversion can be obtained. To the first filtrate of 108 liters, containing unconverted calcium dipicrylaminate, there was added such a quantity of 47

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per cent nitric acid that a pH of 3.6 was obtained. This caused precipitation of the excess dipicrylaminate.

Pilot Plant in Operation

A further example describes the application of the process to the recovery from sea-water of 5,000 tons of K_2O per year. According to this example, 1,750 cubic meters of sea-water containing 0.43 kg. of K_2O per cubic meter are pumped per hour into a tank to which there are also added per hour 50 cubic meters of a solution of calcium dipicrylaminate containing 5.6 tons of dissolved dipicrylamine. Approximately, 75 per cent of the potash content is precipitated, corresponding to 0.57 ton K_2O per hour.

It is understood that the process above described has been developed by Mr. J. Kielland, and that the experimental plant is erected at the Heroya works of the Norsk Hydro company.

HOW SHALL WE FERTILIZE VEGETABLE CROPS?

(Continued from page 8)

a heavy rain before the crop has made sufficient root growth to meet between the rows. However, this leaching probably has been overemphasized. If the roots do not meet between the rows 3 weeks after the plants are set, the soil is probably in too poor condition to support good root action. Such plants would not be benefited by fertilizer. I saw a tomato field last summer in which the plants were just large enough to be covered by a bushel basket. The roots had not gone more than a foot from the plants, and none of the roots were very active. The plants looked badly chlorotic, were making very little growth, but had set 10 to 20 fruits. They had been given a liberal supply of fertilizer. When limestone was worked into the soil around the roots, they started to grow, and the chlorotic condition disappeared.

Broadcasting the fertilizer probably is not the best method. In the experiments where it was compared with plowing under the fertilizer at New Brunswick, it has not produced as good results. There may be certain cases where broadcasting will produce better results, but over a period of years plowing under should give better results.

Plowing Under Fertilizer

Plowing under the fertilizer places some in the bottom of the furrow, while some is distributed over the back of the previously turned furrow. For vigorously rooted plants this seems ideal. It is far enough from the roots to prevent injury when the plants are young, and what seems even more important, at no time does the plant obtain an excessive amount of plant food with which to make an abnormal growth. Most crops grown in rows are planted deep enough so that the fertilizer at the bottom of the furrow is actually only a few inches from the roots at the time plants are set, or if seed is planted, the young seedlings will make contact within a short time.

It distributes phosphoric acid more uniformly and places the fertilizer where more soil moisture makes it available to the plant. The subsoil does not become deficient in phosphorus or lime where fertilizer and lime are plowed under. As a result crops grow more uniformly, somewhat comparable to growth from manure.

Applying Fertilizer in Bands

This method has some advantages and is particularly adapted for acid soils. It has given particularly good results on potato farms, where the soils must be strongly acid to prevent scab. A potato variety that could be grown on neutral soils would be a boon to vegetable growers who wish to grow potatoes in rotation with other vegetable crops. The same may be said of the sweet potato, but because this crop remains on the ground all season and is grown on the lighter soils, other methods of fertilization may be used.

By placing the fertilizer in 2-inch bands, 3 inches from the plant or seed and at the same level, it is possible for the roots to get ample phosphoric acid before it is fixed in the soil. Lime applied later will release this phosphoric acid. Phosphoric acid must be available more or less continuously throughout the life of the plant.

Where other crops must be grown in rotation with potatoes, the band method may be necessary to secure the most out of the soil. The

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See Page 4

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TRONA

method is not suitable where fertilizer is applied only 1 year in 4, because the phosphoric acid is not distributed between the rows to accommodate the crops that are grown broadcast. It may be more economical to apply the fertilizer in bands, because the grower can use less.

The Split Application Method

Perhaps there is no better method of applying fertilizer than to apply it to the crop when it needs it, in such a manner that it can absorb it, and in such amounts that the fertilizer will not injure the roots. However, few growers will do this, regardless of how good their intentions may be. It requires several applications at timely intervals, and very often the grower does not get the application on until it is too late. There are many modifications of this method. They all mean a greater expenditure of labor for the grower, but may save him some money on fertilizer. The methods have application on the lighter and acid soils and make it possible to grow good crops on these soils but at much greater expense.

On the loamy sands or the very light sandy loam soils, 200 or 300 pounds of fertilizer may be applied under the row, and further applications would then have to be made between the rows as the crop needed it. Or the fertilizer could be used in solution, part applied when the plants are set or the seed is sown, and additional fertilizer applied in water between the rows at semi-monthly intervals. This method has given particularly good results.

There are several methods that may be mentioned: broadcasting, plowing under, or applying the phosphoric acid under the row and applying the nitrogen and potash as side-dressings at frequent intervals as needed; applying two-thirds of the fertilizer as above but applying mixed fertilizer as side-dressings; applying a third of the fertilizer under the row and the remainder as side-dressings; or broadcasting two-thirds before or after plowing and placing the remainder under the row. These methods are applicable to acid soils, but are more costly than to correct the acidity with lime and plow under the fertilizer.

The Row Method

This method consists of applying all the fertilizer under the row. The fertilizer is applied on the surface and worked into the soil with a cultivator or other suitable implement. This is a good practice in years of scanty rainfall and on acid soils, but may be too much of a good thing in years of good rainfall. If the grower can use this method without killing his plants, he may get very good results. It does not give good results every year. It has few real advantages and yet is used extensively by growers, because they can get fairly good results on acid soils. Furthermore they do not spend much time putting the fertilizer on.

Starter Solution

This should be mentioned, because it can be used with any method except where large quantities of fertilizer are used in the row. It consists of applying fertilizer dissolved in water around the plants as they are set, or it may be applied in the furrow with the seed. On acid soils this adjunct to other methods has given particularly good results. On well-limed soils that have received ample fertilizer in the past, there may be no advantage in using it. It has a particular use where fertilizer is plowed under.

Subsoil Fertilization

Fertilization accompanies plowing of the subsoil, or lime and superphosphate are merely applied in the bottom of the furrow. This is a temporary practice that is necessary on some farms because of the too long-continued use of row, band, or surface fertilization without lime. It probably would not be necessary where fertilizer and lime have been plowed down in the past, nor where sufficient lime has been used to keep the phosphoric acid mobile. However, where it was needed, it has given phenomenal growth. Asparagus plants have made three times as much growth by this method over what was considered good growth by accepted cultural methods.

A combination of plowing under lime and fertilizer with the starter solution will probably give the best results at the least expense and will build up a permanent fertility in the soil that will eliminate the major cultural problems of the vegetable grower. Acid soils require special attention. Light sandy soils may require special attention. Where only a few pounds of fertilizer are used, row methods may be better.

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For Alphabetical List of Advertisers, see page 33.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
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Hydrocarbon Products Co., New York City.

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Chemical Construction Corp., New York City.

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Link-Belt Company, Philadelphia, Chicago.

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Chemical Construction Corp., New York City.

BURNERS—Oil
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Synthetic Nitrogen Products Co., New York City.

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Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
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MACHINERY—Power Transmission
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Stedman's Foundry and Mach. Works, Aurora, Ind.
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MACHINERY—Tankage and Fish Scrap
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MAGNETS
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE AND CARBONATE
Tennessee Corporation, Atlanta, Ga.

MANGANESE SULPHATE
Tennessee Corportion, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
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Huber & Company, New York City.
International Agricultural Corp., New York City.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS
Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS
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American Cyanamid Co., New York City.
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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Bradley & Baker, New York City.
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Huber & Company, New York City.
International Agricultural Corp., New York City.
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Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
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Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
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Schmaltz, Jos. H., Chicago, Ill.
Synthetic Nitrogen Products Co., New York City.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers and Importers
American Potash and Chem. Corp., New York City.
Potash Co. of America, Baltimore, Md.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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Sturtevant Mill Co., Boston, Mass.

PUMPS—Acid-Resisting
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Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
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Baker & Bro., H. J., New York City.
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Sturtevant Mill Co., Boston, Mass.

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Sackett & Sons Co., The A. J., Baltimore, Md.
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SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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STACKS
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Texas Gulf Sulphur Co., New York City.

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
U. S. Phosphoric Products Corp., New York City.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Agricultural Corp., New York City.
U. S. Phosphoric Products Corp., New York City.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City.

TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
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Smith-Rowland Co., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

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Sackett & Sons Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
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UREA-AMMONIA LIQUOR
Du Pont de Nemours & Co., E. I., Wilmington, Del.

VALVES—Acid-Resisting
Atlanta Utility Works, East Point, Ga.
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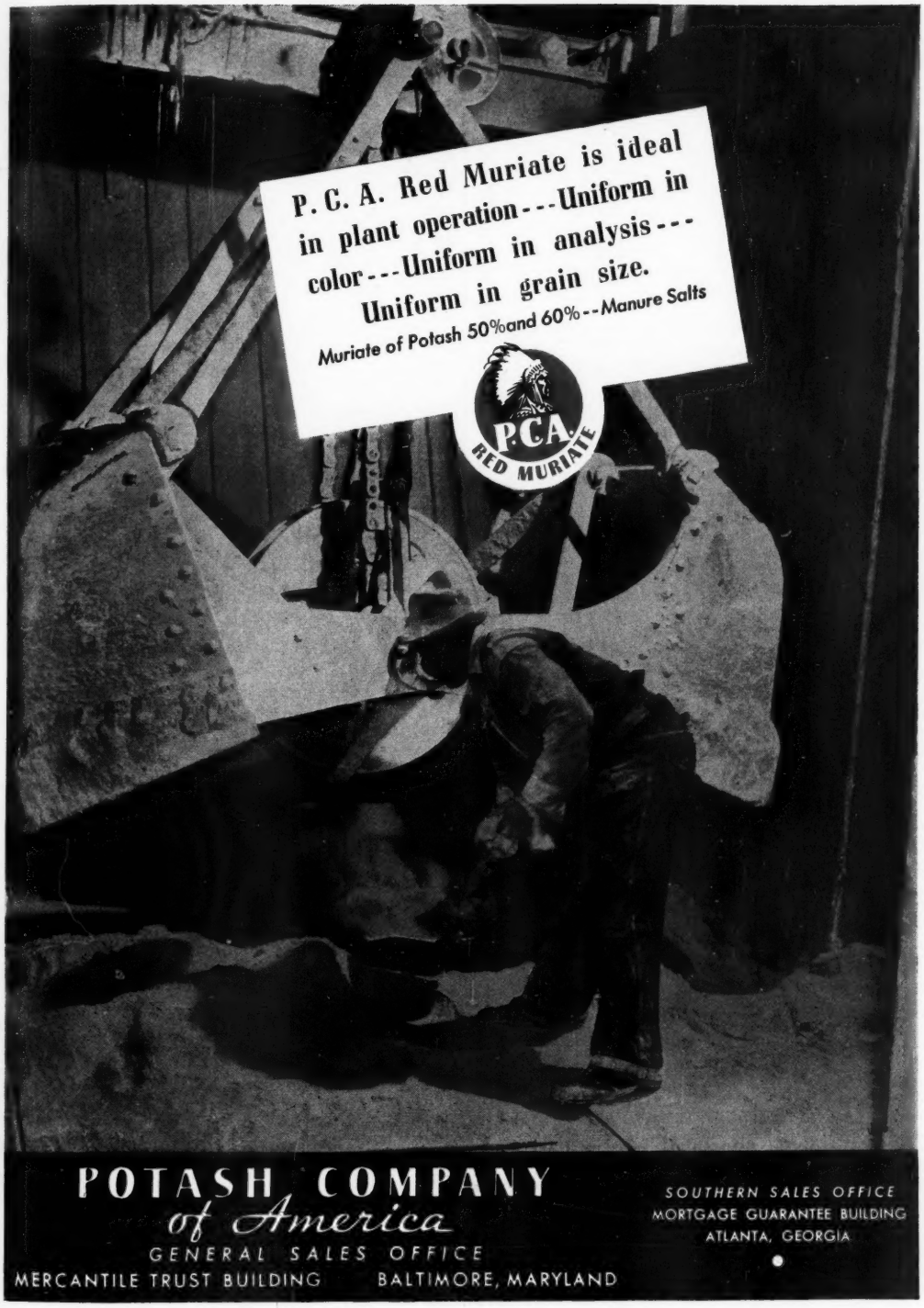
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